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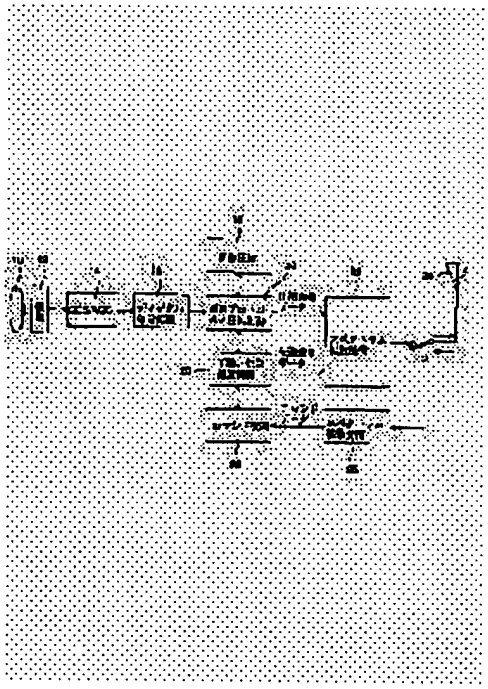
(54) IMAGE TRANSMISSION SYSTEM, IMAGE TRANSMITTER AND IMAGE RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To send the image with a resolution and a transmission speed in matching with a display capability of an image receiver side.

SOLUTION: A spread spectrum reception circuit 26 receives information of a monitor display capability for an image receiver side from the image receiver side. A command demodulation circuit 28 applies a control command according to an output of the circuit 26 to a compression/transmission speed control circuit 30. The circuit 30 controls a compression rate in an image compression circuit 18 and a transmission speed (parallel number) in a spread spectrum transmission circuit 22 according to the control command. A picked-up image in an image pickup element 12 is compressed by the image compression circuit 18, subjected to spread spectrum processing with a designated parallel number by the spread spectrum transmission circuit 22 and the resulting signal is sent from an antenna 24. The image receiver side is provided with a memory to store a display capability of a monitor of the image receiver side and with a transmission means that sends



the information denoting the display capability to the image transmitter side in the spread spectrum system.

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image sending set and image receiving set which are used for the picture transmission system concerned at the picture transmission system list which transmits image information with a spectrum diffusion transmission system.
[0002]
[Description of the Prior Art] When image information was transmitted by the spectrum diffusion method, it was conventionally carried out with fixed image quality and a fixed transmission speed. Moreover, priority is given to image quality especially in transmission of image data, and, usually the transmission speed of spectrum diffusion was set up highly.
[0003]
[**** which invention tends to solve] However, when the image display means of a receiving side is a low resolution like a small liquid crystal display panel, there is no need of setting up transmission speed highly generally that what is necessary is just to transmit image data by the image quality of extent corresponding to the resolution. Moreover, in a spread spectrum system, if transmission speed is high, a transmission distance will become short. Therefore, in the conventional example, there is a place which transmits an image by the above image quality needed by the image receiving side, therefore shortens the transmission distance vainly.
[0004] This invention aims at showing the image transmission system which may have filled appropriately the demand to both image quality and a transmission distance with the image quality demanded by the image receiving side as transmitted image information.
[0005] This invention aims at showing the picture transmission system which transmits image information by the image quality specified by the image receiving side again.
[0006] This invention aims at showing an image sending set and an image receiving set applicable to still such a picture transmission system.
[0007]
[Means for Solving the Problem] In the image sending set, at least the picture compression conditions of the image which should be transmitted, and one side of transmission speed were controlled by this invention according to the display capacity information that it was inputted.
[0008] Display capacity information is the display capacity of for example, an image receiving side, and is transmitted from an image receiving side. Thereby, image information can be transmitted now with the resolution and/or transmission speed according to the display capacity needed by the image receiving side. By selection of resolution and/or transmission speed being automated, handling becomes easy.
[0009]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.
[0010] Drawing 1 shows the outline configuration block Fig. of the image transmitting side of this example. The lens with which 10 carries out image formation of the optical image of a photographic

subject to the photo-electric-conversion side of an image sensor 12, and 14 CDS/AGC circuit which carries out sample hold of the analog picture signal outputted from an image sensor 12, and is made into proper signal level, and 16 The digital-signal-processing circuit which carries out A/D conversion of the analog output of CDS / AGC circuit 14, and performs image pick-up signal processing, such as a gamma correction and color balance adjustment, in digital one, The picture compression circuit which carries out the data compression of the image data which 18 should transmit, and 20 While controlling the picture compression circuit 18, the compression image data from the picture compression circuit 18 is changed into the data format suitable for spectrum diffusion transmission. And the communications protocol / compression control circuit which controls a communications protocol, and 22 are spectrum diffusion sending circuits which carry out the spectrum diffusion modulation of the data from a communications protocol / compression control circuit 20, and are supplied to an antenna 24.

[0011] 26 receives the control command by which the spectrum diffusion modulation was carried out from the image transmitting side, and the spectrum diffusion receiving circuit to which it restores, and 28 From the data to which it restored by the spectrum diffusion receiving circuit 26 to control command (in this example) The command demodulator circuit which restores to the information about the image quality which an image receiving side requires, and 30 While controlling the rate of picture compression of the picture compression circuit 18 through a communications protocol / compression control circuit 20 according to the control command outputted from the command demodulator circuit 28 They are the compression / transmission-speed control circuit (microcomputer) which controls the data transmitting rate of the spectrum diffusion sending circuit 22.

[0012] Drawing 2 is the block diagram showing the detail of the picture compression circuit 18. A raster / block conversion circuit 40 changes into a 8x8-pixel pixel block the image data which should be compressed, and, as for the discrete cosine transform (DCT) circuit 42, 8x8 carries out the discrete cosine transform of the pixel block for the output of a raster / block conversion circuit 40 to a unit. The quantization circuit 44 quantizes the output (transform coefficient data) of the DCT circuit 42 according to the specific quantization table supplied from a quantization table store circuit (for example, look-up table), and the Huffman coding circuit 48 carries out Huffman coding of the output data of the quantization circuit 44 according to the specific Huffman table supplied from the Huffman table store circuit 50. The output of the Huffman coding circuit 48 turns into an output of the picture compression circuit 18.

[0013] The quantization table supplied to the quantization circuit 44 from the quantization table store circuit 46 and the Huffman table supplied to the Huffman coding circuit 48 from the Huffman table store circuit 50 are chosen by the compression control signal 52 from the outside. That is, the compressibility of the picture compression circuit 18 is controllable by the compression control signal 52 from the outside.

[0014] Drawing 3 shows the outline configuration block Fig. of the spectrum diffusion sending circuit 22. The deserializer which changes into n parallel data the serial data which 60 should transmit from a communications protocol / compression control circuit 20, and 62 The number control circuit of juxtaposition which controls the number of juxtaposition of a deserializer 60 according to the transmission-speed data from compression / transmission-speed control circuit 30, The diffusion coder which generates a diffusion sign which is different to each parallel data with which 64 is outputted from a deserializer 60, respectively, and 66-1 - 66-n The multiplier which carries out the multiplication of each diffusion signs PN1-PNn which the diffusion coding generator 64 generates to each parallel data outputted from a deserializer 60, and 68 The switch which follows transmission-speed data, and turns on / turns off each output of a multiplier 66-2 - 66-n, The selection-signal generation circuit which generates the selection signal with which 70 controls a switch 68, 72 The output of one diffusion sign PN 0 from the diffusion coder 64, and a multiplier 66-1, And the adder adding the output of the multiplier 66-2 chosen by the switch 68 - 66-n, RF circuit where 74 changes the output of an adder 72 into a transmit-frequencies signal, and 76 are gain control circuits which control the gain of the RF circuit 74 according to transmission-speed data (specifically the number of juxtaposition).

[0015] By such configuration, the number control circuit 62 of juxtaposition and the selection-signal

generation circuit 70 change the number of juxtaposition according to transmission-speed data. Consequently, the data transmission rate of the data which should be transmitted is changed.
[0016] Drawing 4 shows the outline configuration block Fig. of the receiving-side equipment in this example. In drawing 4 110 a transceiver antenna and 112 It restores to the spectrum diffusion sign received with the transceiver antenna 110. The image expanding circuit which the spectrum diffusion receiving circuit which outputs compression image data and transmission-speed data, and 114 elongate compression image data, and restores image data, and 116 The communications protocol control circuit which the image expanding circuit 114 is used [control circuit] and restores the compression image data from the spread-spectrum receiving circuit 112, 117 is a transmission-speed control circuit (microcomputer) which controls the communications protocol control circuit 116 according to the transmission-speed data from the spectrum diffusion receiving circuit 112.
[0017] The digital-signal-processing circuit where 118 changes the image data from the communications protocol control circuit 116 into an analog signal, the NTSC encoder from which 120 changes the output signal of the digital-signal-processing circuit 118 into an NTSC video signal, and 122 are monitors which carry out graphic display of the output signal of the NTSC encoder 120.
[0018] It is the spectrum diffusion sending circuit which the monitor information ROM in which the information concerning [124] the monitors 122, such as a class of monitor 122, magnitude, and resolution, is stored, and 126 read storage information from the monitor information ROM 124, and the command generation / modulation circuit changed into the command data of a predetermined format, and 128 carry out the spectrum diffusion modulation of the command data generated by command generation / modulation circuit 126, and transmits to an image transmitting side through an antenna 110.

[0019] Drawing 5 shows the outline configuration block Fig. of the image expanding circuit 114. The reverse quantization circuit which reverse-quantizes the output of the Huffman decryption circuit 130 using the quantization table on which the Huffman decryption circuit which carries out the Huffman decryption of the compression image data first using the Huffman table on which 130 is transmitted with compression image data, and 132 are transmitted with compression image data, the reverse DCT circuit where 134 carries out the reverse discrete cosine transform of the output data of the reverse quantization circuit 132, and 136 are the block / the raster conversion circuit which changes the output data of a reverse DCT circuit 134 in order of a raster from the order of a block. The output of a block / raster conversion circuit 136 is an output of the image expanding circuit 114, and becomes the restored image data.
[0020] By the transmitting side, the configuration shown in drawing 5 decryption [Huffman], quantizes [reverse-] and changes [reverse-DCT-], and DCT conversion, quantization, and the compression image data by which Huffman coding was carried out are restored to the original image data.
[0021] Drawing 6 shows the outline configuration block Fig. of the spectrum diffusion receiving circuit 112. RF circuit which changes into a predetermined internal frequency the signal with which 140 was received with the transceiver antenna 110, and 142 Supplement with the synchronization to the diffusion sign which received, and the synchronous circuit to maintain and 144 The diffusion coder which generates the same diffusion sign as the diffusion sign which received according to the sign synchronizing signal and clock signal which are outputted from the synchronous circuit 142, and 146 The carrier regenerative circuit which reproduces a carrier signal, and 148 from the diffusion sign PN 0 for carrier playback outputted from the diffusion coder 1443, and the output signal of the RF circuit 140 The carrier signal from the carrier regenerative circuit 146 and n diffusion signs from the diffusion sign generating circuit 144 are used. The baseband demodulator circuit which carries out the baseband recovery of the output of the RF circuit 140, The serializer which serializes two or more recovery data with which 150 is outputted from the baseband demodulator circuit 148, The number detector of juxtaposition where 152 detects the number of juxtaposition in the spectrum diffusion sending circuit 22 from the internal signal in the baseband demodulator circuit 148, 154 is the number control circuit of juxtaposition which outputs transmission-speed data while controlling the number of juxtaposition serialized in a serdes 150 according to the number of juxtaposition detected by the number detector 152

of juxtaposition.
[0022] By the configuration shown in drawing 6, the signal by which the spectrum diffusion modulation was carried out gets over. Such a configuration and the actuation itself are common knowledge.
[0023] Drawing 7 shows the operation flow chart of the image transmitting side according to the monitor information on an image receiving side. The information about the monitor 122 memorized by the monitor information ROM 124 consists of information, such as types (CRT or liquid crystal display panel) of a screen size and a display device, horizontal resolution, vertical definition, and the number of pixels.
[0024] An image transmitting side acquires the monitor information from an image receiving side (S1), and judges whether high-definition transmission should be carried out according to the contents (S2). For example, with the CRT monitor whose monitor 122 of an image receiving side is 29 inches, in being 700 horizontal resolution, it chooses high-definition transmission. Compression / transmission-speed control circuit 30 chooses the thing of low voltage shrinking percentage as a quantization table in the quantization circuit 44 of the picture compression circuit 18, compresses the image which should be transmitted with low voltage shrinking percentage (S3, S4), makes [many] the number of juxtaposition of the transmission data in the spectrum diffusion sending circuit 22, and, specifically, makes transmission speed a high speed (S5).
[0025] Moreover, by the 4 inches liquid crystal display monitor, the monitor 122 of an image receiving side chooses the picture transmission of low image quality [control circuit / 30 / compression / / transmission-speed], when the number of pixels is about 70,000. Compression / transmission-speed control circuit 30 chooses the thing of high-pressure shrinking percentage as a quantization table in the quantization circuit 44 of the picture compression circuit 18, compresses the image which should be transmitted with high-pressure shrinking percentage (S6, S7), lessens the number of juxtaposition of the transmission data in the spectrum diffusion sending circuit 22, and, specifically, makes transmission speed a low speed (S8).
[0026] Thus, the compressed compression image data is transmitted to an image receiving side with a selected transmission speed (the number of juxtaposition) (S9).
[0027]
[Effect of the Invention] According to this invention, image information can be transmitted with the suitable resolution and/or the transmission speed according to image display capacity of a receiving side so that he can understand easily from the above explanation.

[Translation done.]

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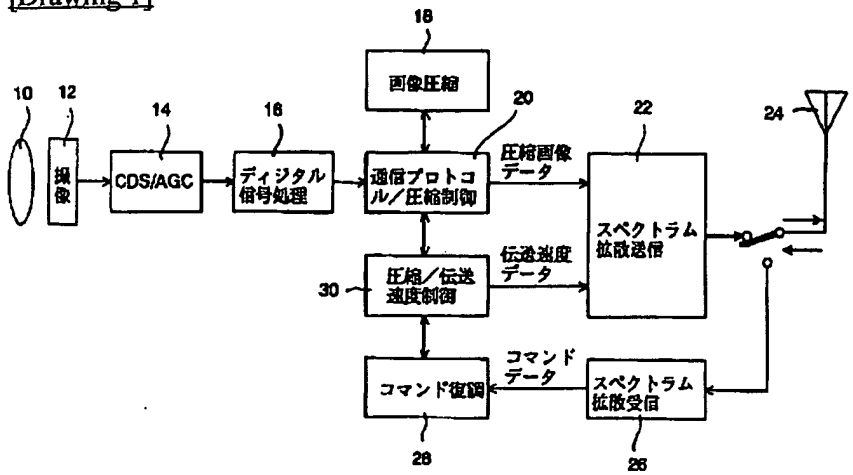
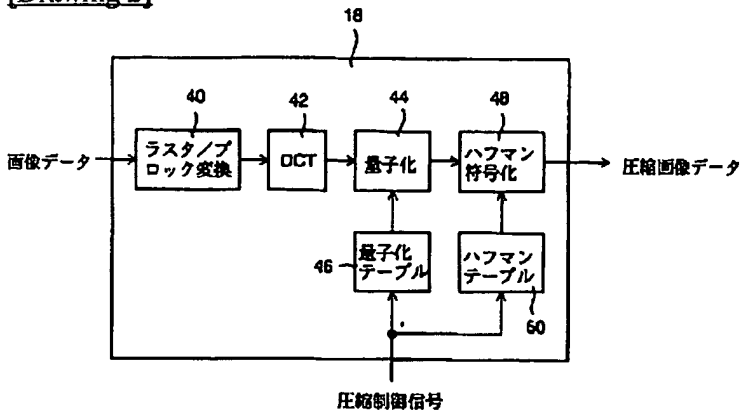
DRAWINGS

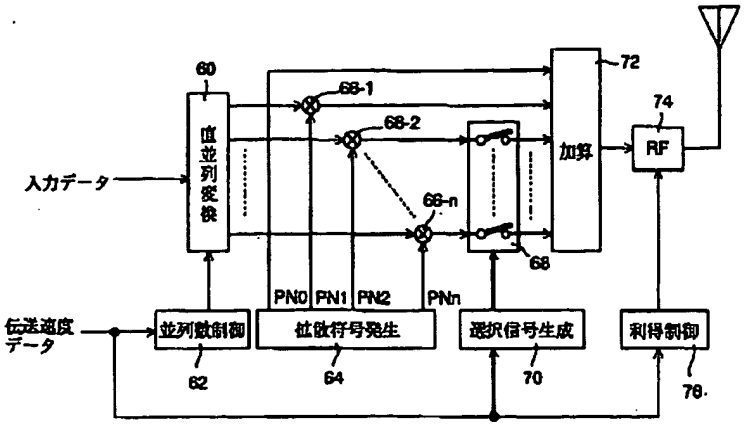
[Drawing 1]



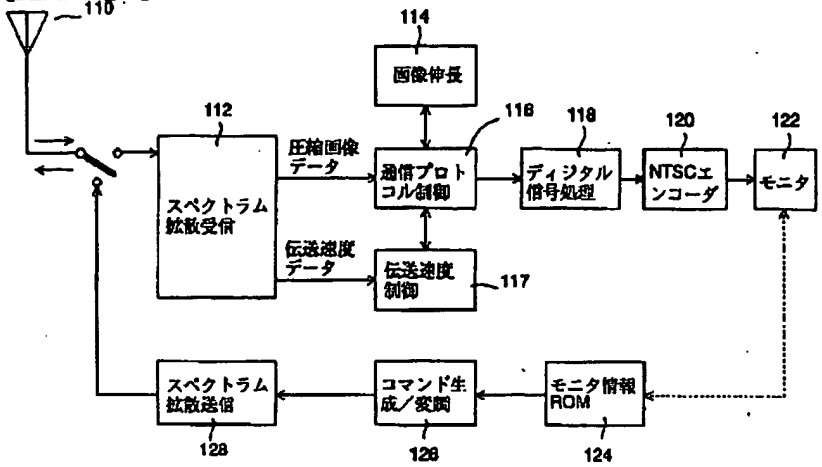
[Drawing 2]



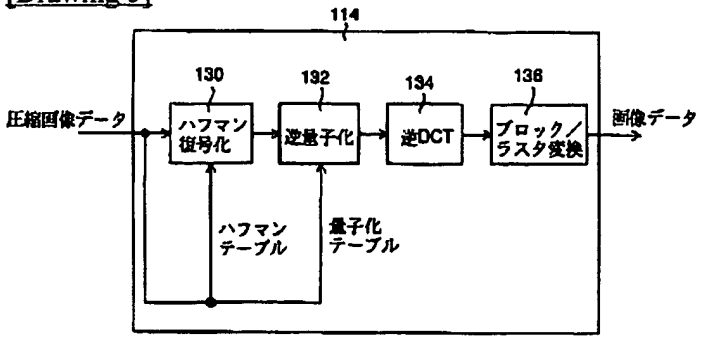
[Drawing 3]



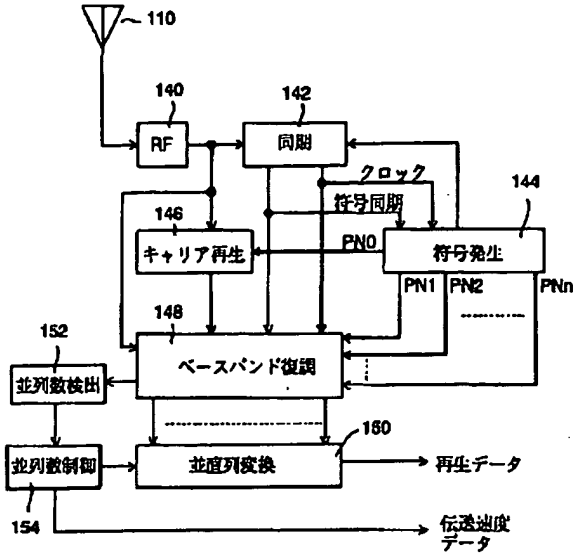
[Drawing 4]



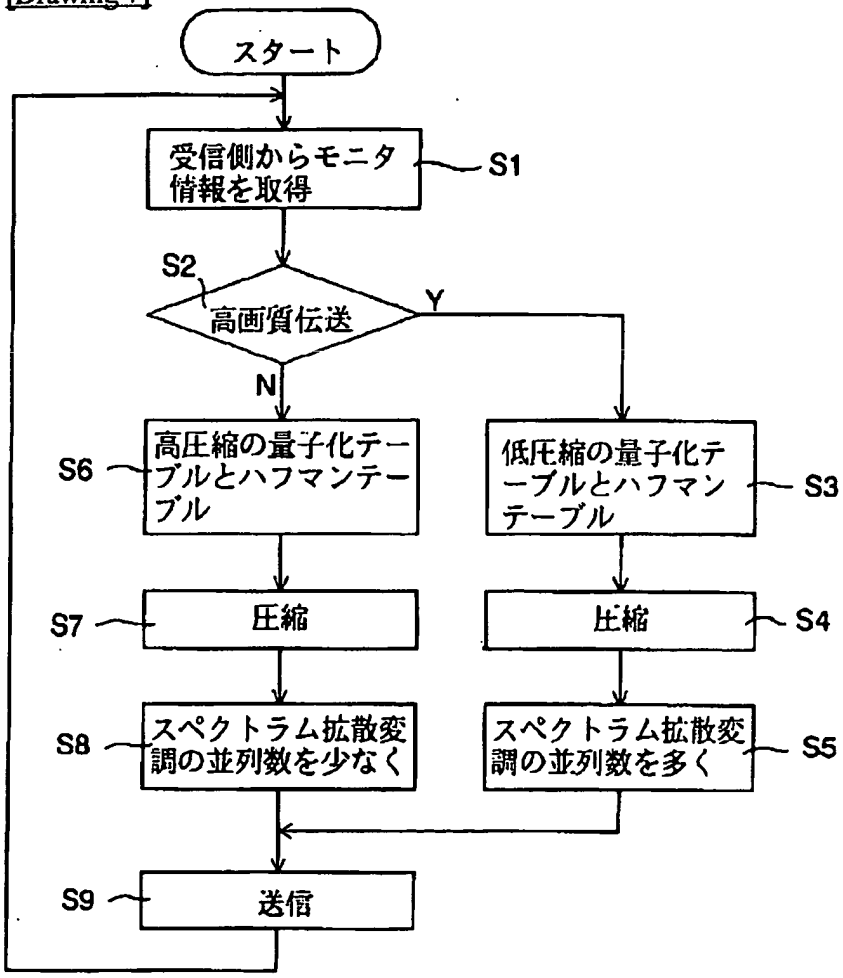
[Drawing 5]



[Drawing 6]



[Drawing 7]



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